Unit #6 Probability
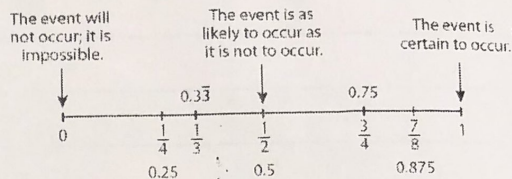
① Vocabulary

② Using Venn Diagrams

③ Soccer/XC Venn

④ Skills Check - Conditional

⑤ Review Notes

Vocabulary

Vocabulary, Set Notation, & Venn Diagrams

Probability
- A number from 0 to 1
- As a percent from ___0___ to ___100%___
- Indicates how likely an ___event___ will occur.

The event will not occur; it is impossible.

The event is as likely to occur as it is not to occur.

The event is certain to occur.

$0.33\overline{3}$ 0.75

0 $\frac{1}{4}$ $\frac{1}{3}$ $\frac{1}{2}$ $\frac{3}{4}$ $\frac{7}{8}$ 1

0.25 0.5 0.875

Experiment
- Any process or action that has observable results
- Example: ___drawing a card from a deck of cards___

Outcomes
- ___Results from experiments___
- Example: ___all the cards in the deck are possible outcomes.___

Sample Space
- The set (or list) of ___all possible outcomes___
- Also known as the ___universal set___
- Example: ___list of all cards in the deck___

Event
- A subset of an ___experiment___
- An outcome or ___set of desired outcomes___
- Example: ___drawing a jack of hearts___

Set
- ___List or collection of items___

Subset
- List or collection of ___items___ all contained within another set.
- Denoted by ___$A \subset B$___ if all the elements of A are also in B.

Empty Set
- A set that has __NO__ __Elements__
- Also called a __null__ __set__
- Denoted by __$\emptyset$__ or $\{\}$

Union
- Denoted by __U__
- To unite
- Everything in __both__ sets

Intersection
- Denoted by __$\cap$__
- Only what the sets __share__ in common.

Complement
- Denoted two different ways: __A'__ or __$\bar{A}$__
- Everything __outside__ of this set

Hector has entered the following names in the contact list of his new cellphone: Alicia, Brisa, Steve, Don, and Ellis. B: Begins w/ vowel   E: ends w/ vowel

1. Draw a venn diagram to represent this.

2. List the outcomes of B.
   Ellis, Alicia

3. List the outcomes of E.
   Alicia, Steve, Brisa

4. List the outcomes of B∩E.
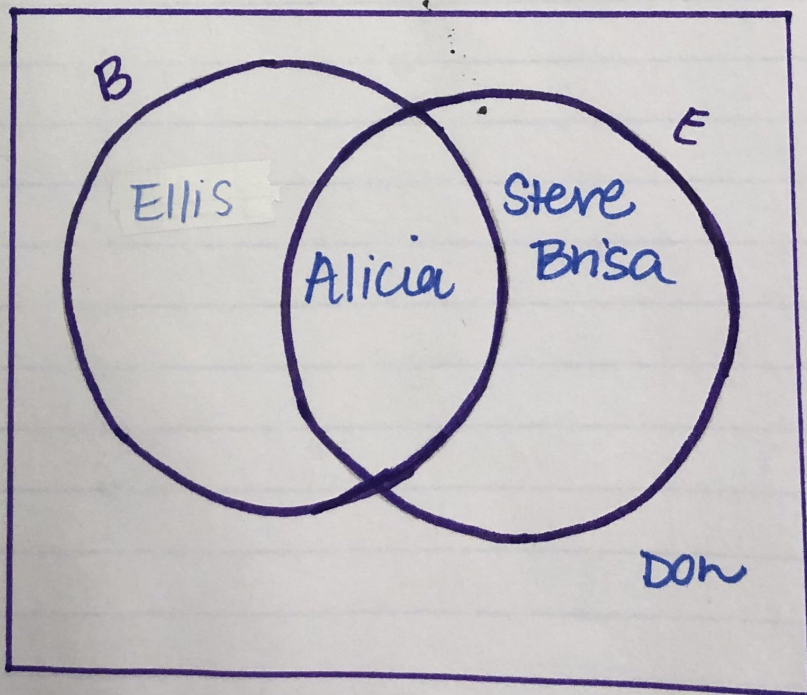   Alicia

5. List the outcomes of B∪E.
   Ellis, Alicia, Steve, Brisa

6. List the outcomes of B'.
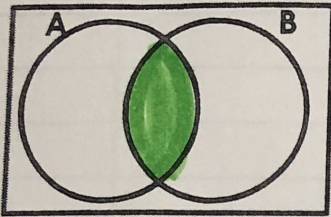   Steve, Brisa, Don

7. List the outcomes of (B∪E)'.
   Don

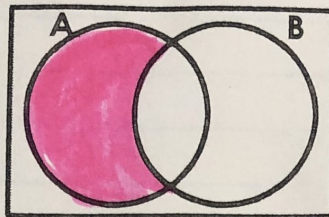# Using Venn Diagrams
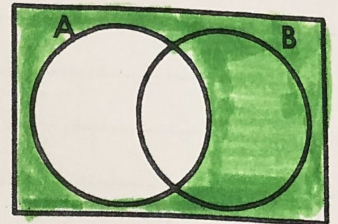
Shade in the appropriate area of the Venn Diagram.
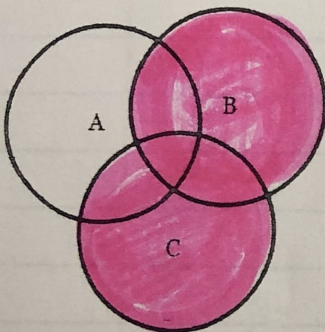
intersect

1. $A \cap B$

2. $A \cap B'$

3. A'

union "combine"
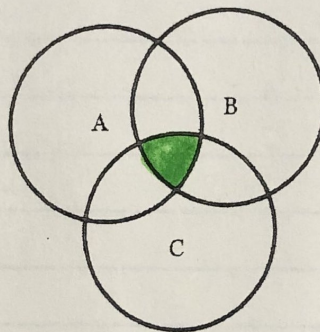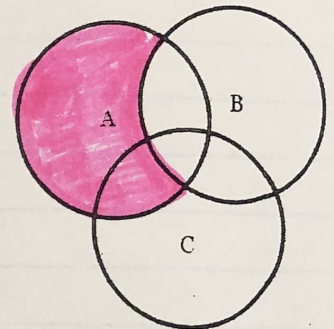
4. $B \cup C$

5. $A \cap B \cap C$

6. $A \cap B'$

Mr. Grisham took a poll of his student's favorite type of weather. The students had the choice of hot, cold, and/or rain/snow. The results are displayed in the Venn Diagram. Write your answer as a reduced fraction.

$$\text{Probability} = \frac{\#\text{desired outcome}}{\text{total outcomes}}$$

__5/9__ 6. Find P(Cold). 15/27

__13/27__ 7. Find P(Warm)'.

__5/27__ 8. Find P(Cold ∩ Warm).

__4/27__ 9. Find P(Warm ∩ Rain).

__1/9__ 10. Find P(Warm ∩ Cold ∩ Rain). 3/27

__8/9__ 11. Find P(Cold ∪ Warm). 24/27

Cold — Adam Alice Russell Mike Chet Sam

Warm — Jacob Cameron Maria Jeff Sarah Teresa Kelly Lyle

Rose Abe

Charlie Ray Jenny

Bob

Dina Karla Jenna Dave

Carson Javier James

Rain/Snow

(27)
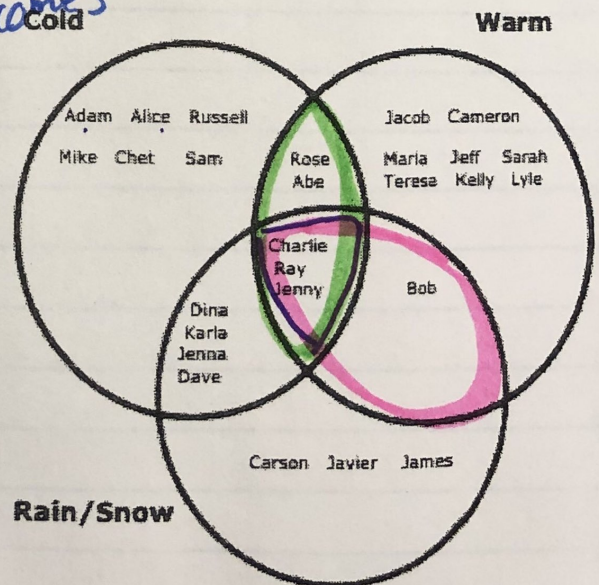
Create a Venn Diagram to model the scenario:

55 students went on a field trip. 24 of the students are soccer players. 27 of the students run cross country. 16 of the students do both soccer and cross counter. There were also some students on the trip that play neither sport.

Soccer   XC

8   16   11

                          20
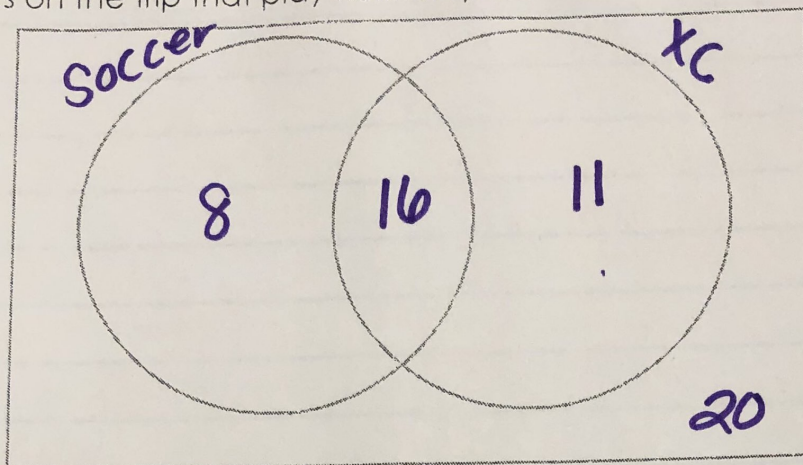
Now find the Following probabilities:

P(Soccer u Cross Country): $\frac{7}{11}$ $\frac{35}{55}$

P (Soccer n Cross Country): $\frac{11}{55} = \boxed{\frac{1}{5}}$

P (Soccer n Cross Country): $\frac{16}{55}$

P (Soccer u Cross Country)': $\frac{4}{11}$ $\frac{20}{55}$

P (Soccer)': $\frac{31}{55}$

P (Cross Country)': $\frac{28}{55}$

Mutually Exclusive vs. Overlapping

P(A)=.3 P(B)= .5 P(A∩B)=.2

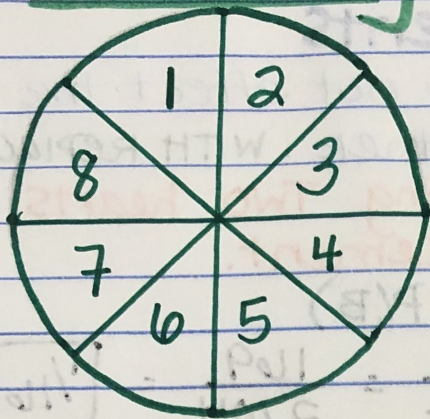Are the events A and B Mutually Exclusive or overlapping? Explain. Then find P(A U B)

P(AUB)= .3 + .5 - .2 = $\boxed{.6}$

P(C)=.4 P(D)=.6 P P(C∩D) = 0

Are the events C and D Mutually Exclusive or overlapping? Explain. Then find P(C U D)

.4 + .6 = $\boxed{1}$

Probability Review Notes

① mutually Exclusive

mutually exclusive events have no common outcomes.

ex: Probability of spinning a 2 or an odd number.

$$\frac{1}{8} + \frac{4}{8} = \frac{5}{8}$$

② overlapping/inclusive events that do have common outcomes

ex: Spinning an even number or a number that begins with a consanant

Formula: $P(A \cup B) = P(A) + P(B) - P(A \cap B)$

$$= \frac{4}{8} + \frac{6}{8} - \frac{3}{8}$$

$$P(A \cup B) = \frac{7}{8}$$

③ Complementary Events The probability of something NOT Happening

ex: what is the probability of the complement of ex 2? $P(A \cup B)'$ or $P(\overline{A \cup B})$

$$P(A \cup B)' = \frac{1}{8}$$

④ Conditional Events The probability of an event happening given a specific event has occured.

ex: Probability of spinning even, given the number begins with a consonant.

Formula: $P(A|B) = \dfrac{P(A \cap B)}{P(B)}$

$$P(A|B) = \frac{3}{6} = \boxed{\frac{1}{2}}$$

⑤ Independent Events

One event occurring does not effect the probability of the other. WITH REPLACEMENT

EX: Probability of drawing TWO hearts in a ROW with Replacement.

Formula: $P(A \cap B) = P(A) \cdot P(B)$

$$= \frac{13}{52} \cdot \frac{13}{52} = \frac{169}{2704} = \boxed{1/16}$$

TO prove independence show one of the Following:

① $P(A \cap B) = P(A) \cdot P(B)$

② $P(A|B) = P(A)$

$P(B|A) = P(B)$

⑥ Dependent Events

One event occurring does effect the probability of the other. WITHOUT Replacement

EX: Probability of drawing two kings in a row without Replacement.

Formula: $P(A \cap B) = P(A) \cdot P(B|A)$

$$= 4/52 \cdot 3/51$$

$$= 12/2652$$

$$= \boxed{1/221}$$